

## Climate Change – part 4

In the last Under The Big Sky newsletter, we looked at some of the astronomical reasons for climate change. Most of these involve the Earth's orbit, tilt, and wobble, and are very long term cycles of many thousands of years. However, one much shorter cycle, that we experience several times in our lives, are the sunspot cycles. Astronomers have found that sunspots vary in a regular and predictable manner. One cycle lasts 11 years. There is only a 0.1 percent increase in solar energy during the sunspots cycle, however it is believed there is an amplification process of this energy as it enters Earth's atmosphere.

Magnetic fields though reverse polarity with every 11 year sunspot cycle, in effect a 22 year cycle. Although we are most familiar with the disruption of radio waves and the increase in Aurora Borealis during these sunspots, there is a faint, but widespread 22 year cycle noted in climate records. The warmer times correspond to increased energy from sunspots. Tree ring records have verified this, but also have shown other longer sunspot cycles that are 154, 204, 455, 500, and 2300 years in length.

Another astronomical source of climate change is the collision of Earth with comets, asteroids, and meteors. We know this has happened in the past; the most obvious example on Earth being a 650 foot deep crater in Arizona, created 50,000 years ago. It is also believed that a huge comet or asteroid, about 6 miles wide, crashed into the Yucatan Peninsula of Mexico about 65 million years ago. This cataclysmic event is thought to be responsible for the sudden extinction of dinosaurs. In the past few thousand years, most meteors have burned up entering the atmosphere with just a few making it to Earth, but nothing unusually large, or with impact on the climate. One well-known large meteor that exploded on entering the atmosphere, occurred over Siberia in 1908. The force of this blast flattened trees for 800 square miles. In this close call, had the meteor directly struck the Earth rather than burn up in the atmosphere, there no doubt would have been a huge dust cloud created on impact that would have had sudden, but short-lived climate effects.

An object from space the size of the 6 mile object that struck the Yucatan, would create a huge dust cloud that would block out the sun. The result would be a very sudden and catastrophic drop in temperature in just a few days. The biggest effects would be short-lived, but lingering dust in the atmosphere could depress temperatures for years. This is not to mention the devastating earthquakes, tsunamis, fires, and winds created by the impact.

The sudden climatic change associated with impacts of this size we know have happened in the past, and will no doubt happen again in the future, with potentially devastating effects. The where, what, and when is unknown at this time.